The Blood Bank as a Public Health Service

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■ *The donation of blood is presented to the public as an altruistic service in which one human helps another. At the same time, the donor receives some help for himself. In the process of blood donation, a medical history is taken, an extremely short physical examination is done, and the donor's blood is studied by various tests. Although this is by no means the equivalent of a complete physical examination performed by a physician, it sometimes can be helpful in discovering early disease or other medical findings which could be pertinent to the donor's health.*

ALMOST ALL practitioners of medicine look upon the community blood bank as providing a needed local service. Patients who could not have survived in previous years are now living because of the easy availability of blood and blood products. Thus, we can truthfully tell donors that they are performing a great humanitarian service since their blood will help someone. At the same time, a donor may benefit beyond the feeling of altruism, for in the process of giving blood he will be subjected to a moderate medical scanning during which some forms of disease may be discovered in their earlier stages. Although by no means the equivalent of a complete history and physical examination performed by his own physician, the cursory examination of a donor has been designed to demonstrate some major disease categories. For many persons who refuse to have or procrastinate in having a routine physical examination, it is better than nothing. This public health function of blood banking has recently been the subject of editorial comment.[1]

What happens medically to a donor when he decides to give blood? First, a medical history is taken. Certain questions in this history are designed to elicit information on conditions that might make donating blood inimical to the donor's health. Others pertain to several disease states which might prove harmful to the recipient. A sample set of questions is shown in Table 1. All answers suggestive of disease are evaluated by the attending physician to see if they are truly significant. In addition, a history of symptoms such as productive cough, chest pain or convulsions is analyzed by the attending physician. If any appear significant the donor is rejected.

During the history taking, a certain amount of donor education takes place. Many of our prospective donors do not know that a carrier state

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TABLE 1.—*Sample Historical and Physical Determinations Made of Donors at Site of Blood Donation*

To Protect Donor	*To Protect Recipient*	*To Protect Both*
Weight	Blood Transfusion within 6 months	Surgical oper. within 6 months
Pulse	Malaria within 2 years	Fever
Blood Pressure	Undulant fever	Polycythemia
Hemoglobin	Eczema, dermatitis	Asthma
Illness, last month	Immunization	Diabetes
Rheumatic Fever	Hepatitis or jaundice	Tuberculosis
Heart Trouble	Contact: Inf. Hepatitis	Cancer
Pain in Chest	Allergy, hives	Under M.D.'s care
Short of Breath	Arms examined (needle marks & infections)	Pregnancy within 1 year
Fainting Spells	Infectious mononucleosis	
Convulsions	Tattoo within 6 months	
Hazardous occupation		
When last donation?		

TABLE 2.—*Analysis of Persons Rejected for Blood Donation — One Year's Experience*

Reason for Rejection	*Percent of Total Rejects*
Low Hemoglobin Level	56.0
Blood Pressure	6.6
Hypertensive (6.2%)	
Hypotensive (0.4%)	
Illness during past month	8.1
Elevated Temperature	1.5
Irregular or rapid pulse	1.5
Cardiac or Vascular Disease	1.9
Pain in Chest	0.15
Shortness of Breath	0.07
Persistent Cough	0.09
History of Tuberculosis	0.12
Surgery within past six months	1.51
Blood Transfusion within 6 mos.	0.19
Dizziness or Fainting Spells	0.48
Convulsions	0.17
Epilepsy	0.16
Near Faint at Hemoglobin Table	0.62
Pregnancy within one year	2.86
Immunizations or Injections	1.9
Exposure to Contagious Disease	0.21
Hepatitis within 2 years*	1.1
Hepatitis contact (6 months)	0.8
Polycythemia	0.23
Diabetes	0.32
Rheumatic Fever	0.25
Brucellosis or Prolonged Fever	0.39
Malaria or Suppressant Drugs	0.16
Malignancy	0.15
Infectious Mononucleosis	0.23
Venereal Disease (information volunteered by Donor)	0.09
Hay Fever or Allergy	0.47
Asthma	0.25
Dermatitis, Eczema, Boils	0.6
Tooth Extraction (within 10 days)	2.18
Nervous/did not feel well	0.18
Under Doctor's Care/Misc. Medical	2.76
Miscellaneous Non-Medical	5.62

*Since our center no longer accepts blood from such donors for plasma fractionation, it is estimated that this figure will be about 6 percent.

exists in certain diseases such as hepatitis or other blood-borne diseases. Our statistics show that roughly 400 persons (0.2 percent) presenting themselves for blood donation are rejected yearly because of having had hepatitis or having been exposed to the disease; and 10.7 percent of all who offer blood are rejected for some medical reason other than hepatitis. Results of a one-year study of all donor rejections are given in Table 2.

During the physical examination, the donor's temperature is recorded, his pulse rate determined and his blood pressure measured. Significant deviations in body temperature are studied further. Occasionally the pulse rate determination permits the discovery of tachycardia or atrial fibrillation previously not known to the patient, and such patients are referred for medical study. A low pulse rate can present more of a problem. Many of the donors with this complaint are athletes, who may be accepted; but occasionally heart blocks can be discovered. About 0.7 percent of all persons presenting themselves for donation are rejected because of hypertension (systolic pressure more than 200 mm of mercury, diastolic—more than 100 mm). Such persons are sent to their physicians for further study. A few donors are found to be hypotensive and are rejected because of the high incidence of donor reactions associated with this abnormality. They too are asked to consult a physician.

One of the most important tests is the determination of the hemoglobin level. The copper sulfate specific gravity method is accepted by the National Institutes of Health and the California State Department of Public Health for mass screening of blood donors. There is a small factor of false-positive error, but the test does not pass an anemic person. Although other more accurate tests have been studied as a substitute,[2] the speed, low cost and ease of reading make the copper sulfate test a good one. Kliman[3] has proposed using the microhematocrit to check all donors who fail the specific gravity test.

After the Donation

After the blood donation has been made, the diagnostic procedures are still not exhausted.

Every unit of blood is examined visually during labeling and again each time it is transferred to another hospital. This examination includes inspection of the red cell mass, the buffy coat and the color of the plasma. All units not visually acceptable are studied further and usually discarded. At the Los Angeles-Orange Counties Red Cross Blood Centers in the last two years, observation of a thick buffy coat led to diagnosis of three previously unknown cases of chronic myelogenous leukemia and one case of macroglobulinemia of Waldenström in apparently healthy donors. Blood units with very fatty plasma are also discarded. Most of the donors with fatty plasma are found to have no disease, but occasionally familial hyperlipemia or hypercholesterolemia may be discovered. Donors with obviously icteric plasma are advised to have jaundice studies performed and the blood from such donors is discarded.

There should be more frequent studies of the red cells but at this time there are few mass production methods. In one recent case, diagnosis of congenital elliptocytosis in the donor was made because the major crossmatch showed oval cells when examined microscopically. Today, with all the automated techniques available, there is no reason a complete blood study could not be performed on every donor if it were felt desirable by the medical community. Thus far it is not being done in most blood banks.

In the laboratory the blood is grouped for the ABO agglutinins and typed for Rh factors. Naturally occurring isoagglutinins (anti A and B) are determined and the results compared with red cell grouping. This comparison can also give an insight into the donor's health. Protein abnormalities such as are found in dysgammaglobulinemia, multiple myeloma, leukemia, liver disease and many others may be discovered by the failure of the red cell grouping to agree with the isoagglutinin confirmation.[4] Further, some rare blood group antigens and antibodies may be found by this same apparent lack of agreement. All disagreements between red cell typing and serum confirmation should be studied to see if they are caused by disease in the donor.

Determination of the strength of the isoagglutinins which is needed to provide low titer blood may sometimes indicate a change in donor population. A recent study of the military personnel at Fort Knox[5] has shown a decrease in the number of low titer donors proportional to the increase in the number of donors immunized against plague.

In addition to providing the normal results for grouping, if the donor's cells are used as a control they will occasionally show an autoagglutinin which may be sequela of a mycoplasma infection or a precursor to an autoimmune hemolytic anemia or be due to other reasons, such as drug ingestion,[6] all of which need to be studied. Some donors do have a positive Coombs test reaction with no apparent disease.[7]

Serological Tests for Syphilis

All donor bloods must be studied with a serological test for syphilis (STS). This is done in California by the Venereal Disease Research Laboratory (VDRL) method. At our blood center, where we have only voluntary donors, we encounter about 0.185 percent reactive or weakly reactive serological tests each year. If results are reactive, the donor is referred to his personal physician or to the Social Hygiene Clinic. It is relatively uncommon to discover a previously unknown case of syphilis; almost all donors with positive reaction have known of their infection. Some observers even feel that routine STS is of little value in the older age group[8] and some believe that seropositive blood can be transfused safely if adequately quarantined.[9] The studies of McGehee-Harvey,[10,11] showed that in a high rate of patients with a biological false positive reaction some type of autoimmune disorder develops later in life. Hence this is probably as good a reason as any for performing the test. More hazardous is the donor with syphilis who has only recently been infected and is seronegative but has spirochetemia. In a documented case recently reported by Chambers,[12] a recipient was apparently infected by a platelet concentrate. Storage of blood for 96 hours at 4°C will kill the spirochetes and this danger can be eliminated. This is probably one good reason why use of fresh blood should be contraindicated except in an emergency. The danger, of course, exists also in fresh blood components.

In addition to grouping red cells for the usual ABO and Rh groups and types, our blood center, like many others conducts routine screening tests for rare blood groups. By this means we are able to develop a rare donor file which is of great value when rare blood is needed for a patient. In addition, the donor with a rare type, and his physician, will know of this fact. This knowledge may be of

great medical importance if the donor ever needs a blood transfusion.

Most blood banks are now screening all units for the presence of irregular antibodies. In fact since the beginning of 1968 this procedure has been required procedure in all Red Cross blood centers and is strongly urged by the American Association of Blood Banks. By the use of this method, the minor crossmatch may be elimi' nated,[13] thus simplifying the hospital crossmatching procedure. The antibody screening also has an important function for the donor. Each donor with an unidentified antibody represents a potential crossmatching problem if he ever needs blood as a patient. If this is an uncommon antibody which requires time to identify, it can endanger his life. Most donors with antibodies have either been pregnant or have received prior blood transfusions[14]; therefore their history might cause one to suspect they could have an antibody, yet there are enough of those donors who have neither a history of pregnancy nor of having received blood transfusions and still have "naturally occurring antibodies" to pose a serious problem. Screening for and identification of these antibodies with subsequent notification of the donor prevents a sudden confrontation by this type of problem. Approximately 0.5 percent to 1 percent of donors in several studies were found to have irregular blood group antibodies.[14,15,16]

It should be possible with the development of automation to perform not only blood grouping and antibody screening but also hematological and chemical studies on all donor blood in the near future; indeed this has already been done in the case of hyperglycemia.[17] By this means many borderline medical problems might be discovered. It is probable there will be more of this kind of investigation in the near future.

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"TUBE OSTOMY" TO AVOID NASAL INTUBATION

"I hate to think of myself lying in a hospital bed for a period of time [after colonic or rectal surgery] with a tube down my nose. So I do an awful lot of 'tube ostomies.' I put in just a couple of purse strings [sutures]; and then . . . I make sure that I get the tube through a little piece of omentum some place or through some fatty mesentery or something some place. I also make the tract as long as possible; and I don't sew the stomach against the peritoneum. There's not going to be any leakage if there's a little omentum there. But I make the tract a long one, and it won't stay open. The length of the tract, I think, is tremendously important."

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